PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference MP 03-017	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/SE 2003/000871	International filing date *(day/month/year)* 28-05-2003	Priority date *(day/month/year)* 20-06-2002
International Patent Classification (IPC) or national classification and IPC G01H 11/04, G01B 7/24, G01L 1/12, G01P 15/11		
Applicant COVIAL DEVICE AB et al		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☒ *(sent to the applicant and to the International Bureau)* a total of 2 sheets, as follows:
      ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s))
      _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).
4. This report contains indications relating to the following items:
   - ☒ Box No. I Basis of the report
   - ☐ Box No. II Priority
   - ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - ☐ Box No. IV Lack of unity of invention
   - ☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - ☐ Box No. VI Certain documents cited
   - ☒ Box No. VII Certain defects in the international application
   - ☐ Box No. VIII Certain observations on the international application

Date of submission of the demand	Date of completion of this report
10-12-2003	13-05-2004
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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/ 2003/000871

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on a translation from the original language into the following language _____, which is the language of a translation furnished for the purposes of:

☐ international search (under Rules 12.3 and 23.1(b))
☐ publication of the international application (under Rule 12.4)
☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

☐ the international application as originally filed/furnished

☒ the description:

pages 1-15 as originally filed/furnished
pages* _____ received by this Authority on _____
pages* _____ received by this Authority on _____

☒ the claims:

pages _____ as originally filed/furnished
pages* _____ as amended (together with any statement) under Article 19
pages* 16-17 received by this Authority on 10-12-2003
pages* _____ received by this Authority on _____

☒ the drawings:

pages 1-9 as originally filed/furnished
pages* _____ received by this Authority on _____
pages* _____ received by this Authority on _____

☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____
☐ the claims, Nos. _____
☐ the drawings, sheets/figs _____
☐ the sequence listing *(specify)*: _____
☐ any table(s) related to the sequence listing *(specify)*: _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages _____
☐ the claims, Nos. _____
☐ the drawings, sheets/figs _____
☐ the sequence listing *(specify)*: _____
☐ any table(s) related to the sequence listing *(specify)*: _____

* *If item 4 applies, some or all of those sheets may be marked "superseded."*

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/ 2003/000871

Box No. V **Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-7	YES
	Claims		NO
Inventive step (IS)	Claims	1-7	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-7	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

Documents cited in the International Search Report:

D1: US 5275049 A
D2: US 4463610 A
D3: US 5982054 A
D4: US 5194806 A
D5: US 5321985 A
D6: EP 0330311 A2
D7: DE 4309413 A1

Documents D1-D4, cited as category X in the Search Report, have been reconsidered to define the general state of the art. Documents D5-D7 also define the general state of the art.

This examination report is based upon the amended claims as filed with the letter of 10-12-2003.

Document D1 discloses an acceleration sensor that comprises magneto-elastic layers (1.6 in fig.1) and a sensor coil (1.5). When the sensor is accelerated, a seismic mass (1.4) is adapted to exert a force on the magneto-elastic measuring layer. Then, the magnetic permeability of the magneto-elastic measuring layer influences the inductance of the sensor coil.

Documents D2-D4 also disclose vibration or strain sensors with magnetostrictive elements that induce voltages in surrounding coils.

Document D1 is considered to represent the closest prior art. The subject-matter claimed differs from D1 in that temporary inner material oscillations, so-called acoustic emission, can be detected with freely suspended amorphous or nanocrystalline band elements. The claimed invention makes it possible to

.../...

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of: Box V

detect atomic movements or oscillations.

Documents D1-D4 do not disclose a method or an apparatus for measuring acoustic emission with freely suspended amorphous or nanocrystalline band elements and no relevant combination of the cited documents would lead a person skilled in the art to the invention defined in the claims. The invention according to claims 1-7 is thus novel and is considered to involve an inventive step. It is also considered to be industrially applicable.

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

Some of the references in the description refer to wrong figures. For example, on page 7, line 30, a reference is made to a half bridge connection in figure 2. However, such a connection cannot be seen in figure 2. The reference on page 10, line 27 is also wrong.

WHAT IS CLAIMED IS:

1. A method of sensing and indicating permanent state deviations via detection of temporary inner material oscillations, so-called acoustic emission, in real time in parts of importance for hardware design and construction, within existing production equipment, e.g. machinery, and/or monitoring of previously built-up infrastructure, **characterised in that** one or more at least approximately 20 µm thick amorphous or nanocrystalline, magnetically heat-treated band elements with high permeability and relatively high magnetostriction are applied in freely suspended manner to a pertinent part, each respective band element being at least partly surrounded by multi-turn coils, of which either the band elements or the coils or both are set in a magnetised basic or initial state, such atomic movements (oscillations) which occur in any optional such state deviation being transferred to the respective band elements, the deviation either giving rise to a clearly measurable and detectable magnetic flow change (dB/dt) in the respective coil in proportion to said atomic movements, or a similarly measurable and detectable inductance change in the respective coil.

2. An apparatus for sensing and indicating permanent state deviations via detection of temporary inner material oscillations, so-called acoustic emission, in real time in parts of importance for hardware design and construction, within existing production equipment, e.g. machinery, and/or monitoring of previously built-up infrastructure, **characterised in that** it comprises one or more at least approximately 20 µm thick amorphous or nanocrystalline, magnetically heat-treated band elements of high permeability and relatively high magnetostriction, which band element/elements being freely suspended and surrounded by multi-turn coils of which either the band elements or the coils or both, are set in a magnetised basic or initial state, such atomic movements (oscillations) as occur in any optional such state deviation, in connection with being transferred to the band element/elements, either giving rise to a clearly measurable and detectable magnetic flow change (dB/dt) in the respective coil in proportion to the atomic movements, or a similarly measurable and detectable inductance change in the respective coil.

3. The apparatus as claimed in Claim 2, **characterised in that** the band element/elements with associated coil/coils are enclosed in an elastically deformable epoxy polymer.

4. The apparatus as claimed in Claim 2 or 3, **characterised in that** the band element/elements and the coil/coils are glued to the object whose permanent state deviations are to be indicated.

5. The apparatus as claimed in any of Claims 2 to 4, **characterised in that** the sensitivity thereof is different depending upon the orientation of the detection direction in relation to the rolling direction of the band element/elements, as a consequence of directional dependent properties in the material.

6. The apparatus as claimed in any of Claims 2 to 5, **characterised in that** the band elements with associated coils are bridge- and amplifier connected in order to increase sensitivity and detectability, respectively.

7. The apparatus as claimed in any of Claims 2 to 6, **characterised in that** it is realised as a glass breakage indicator.